

Fig. 1

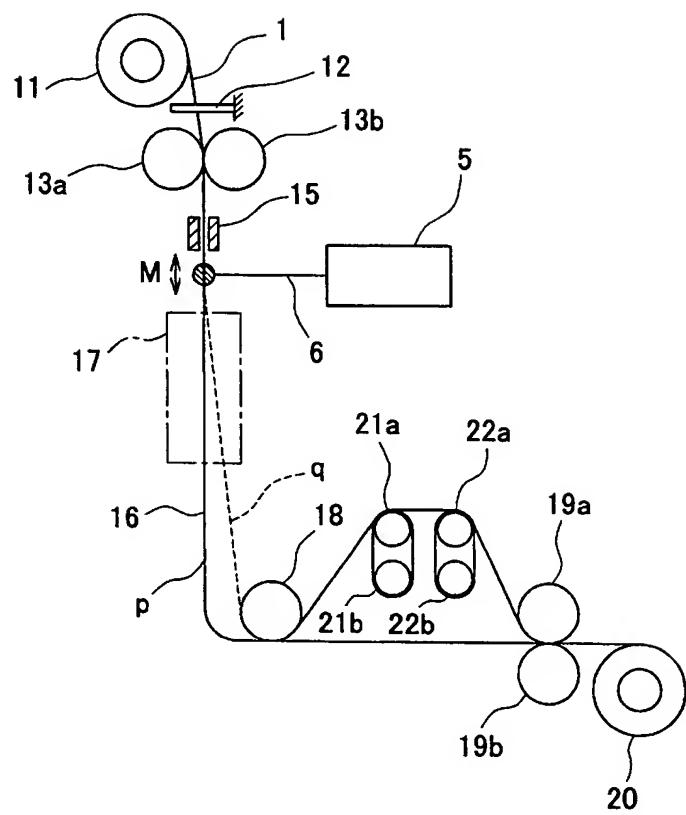


Fig. 2

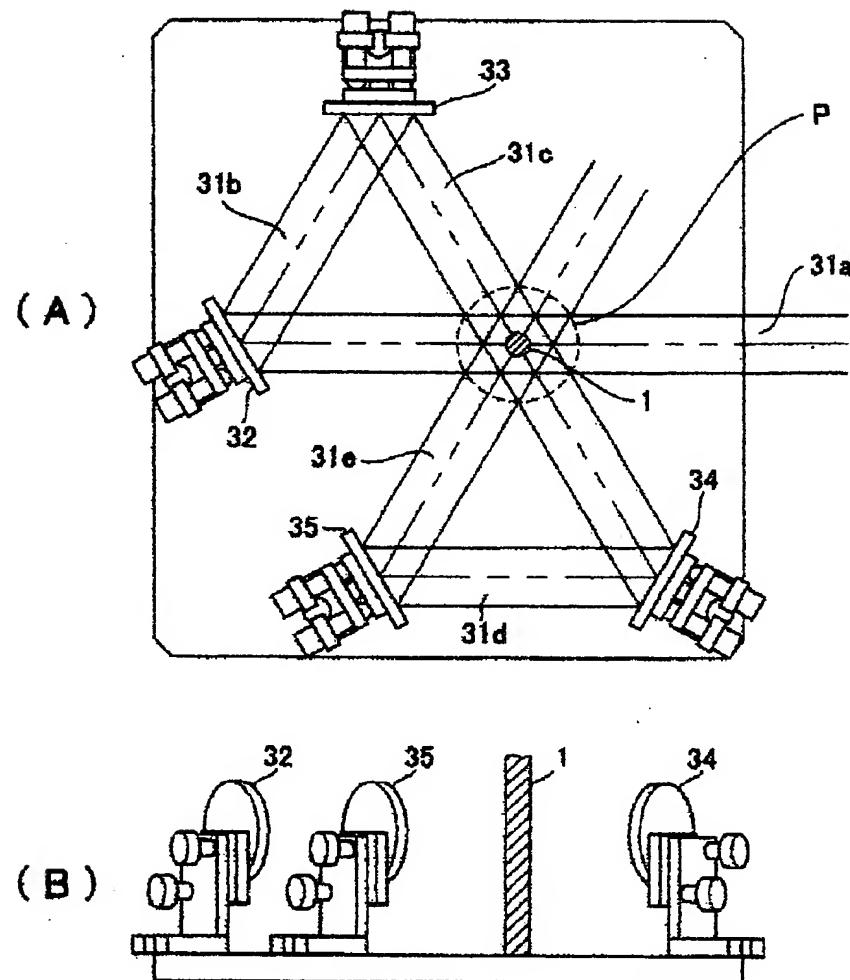


Fig. 3

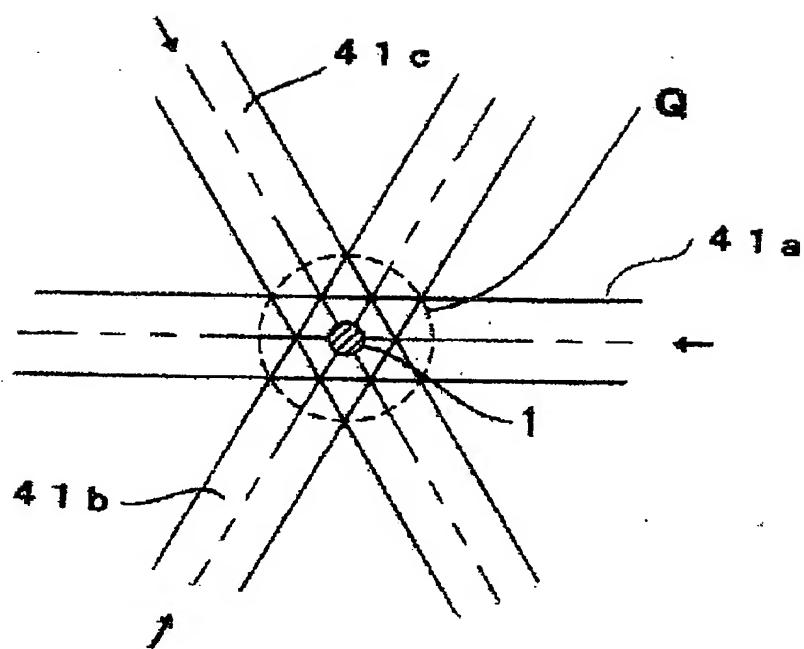


Fig. 4

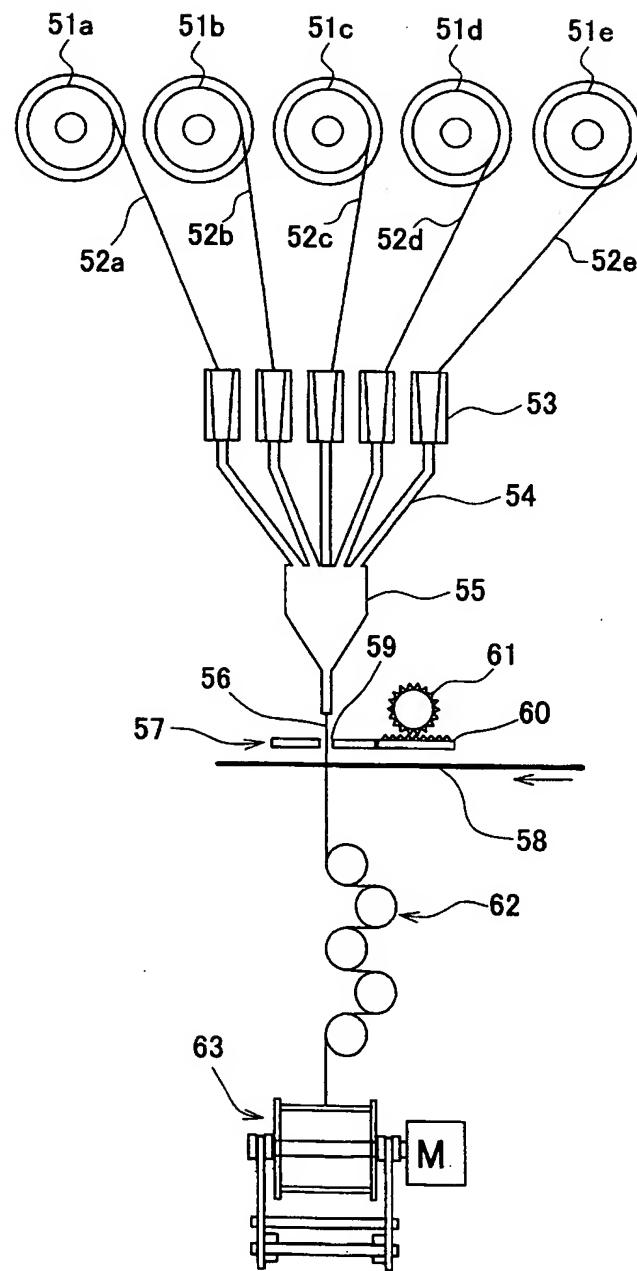


Fig. 5

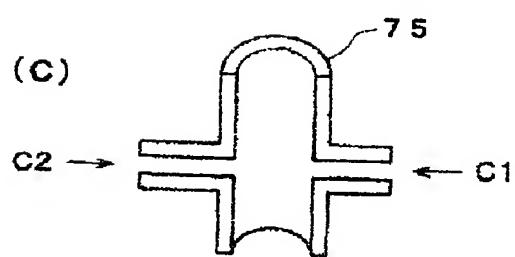
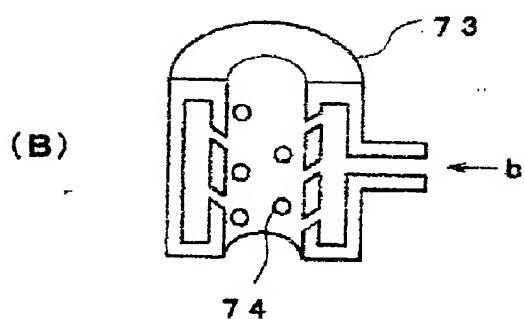
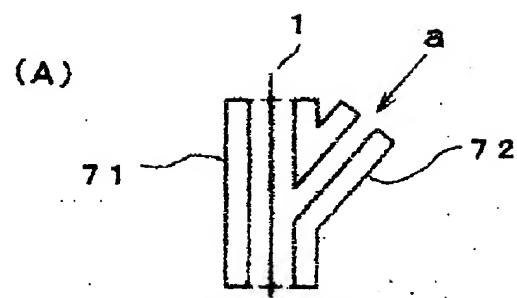


Fig. 6

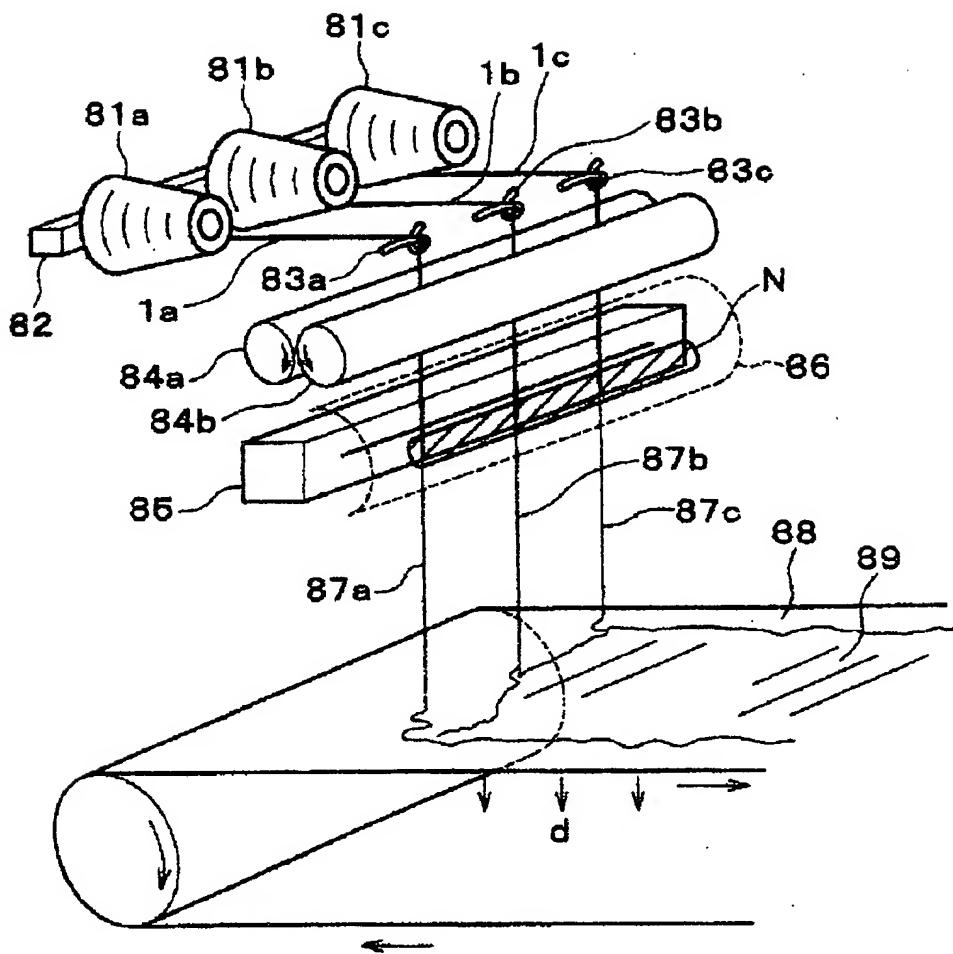


Fig. 7

Variation of diameters and birefringence by drawing of polylactic acid filaments

Supply speed: 0.5 m/min
Watt density: 24 W/cm²

<u>Wind-up speed</u> m/min	Filament diameter μ m	Draw ratio	Birefringence x10 ⁻³	X-ray orientation degree %	Drawing tension MPa
100	5.02	223	6.89	61.8	2.5
200	3.97	357	10.26	75.2	
400	2.57	852	14.78	74.0	
600	1.75	1836	19.26	75.7	2.0
800	1.45	2675	20.29	73.4	
1200	1.45	2675	20.97		0.6
1600	1.20	3906	23.25		0.3
2000	1.20	3906	32.68		

Fig. 8

Variation of diameters and birefringence by drawing of polylactic acid filaments

Supply speed: 0.5 m/min
Watt density: 12 W/cm²

<u>Wind-up speed</u> m/min	Filament diameter μ m	Draw ratio	Birefringence x10 ⁻³	Drawing tension MPa
100	4.98	227	11.66	0.3
200	4.50	278	13.16	2.7
400	3.29	520	13.97	0.9

Fig. 9

Variation of diameters and birefringence by re-drawing and re-heat-treatment of polylactic acid filaments

Treatment	Filament diameter μ m	Draw ratio	Birefringence x10 ⁻³
Laser drawing method	1.45	2674	20.29
Zone drawing method 1 (Drawing Temp.: 80°C)	1.41	2829	30.28
Zone drawing method 2 (Drawing temp.: 80°C)	0.60	15625	
Zone heat treatment method (Heat treatment temp.: 160°C)	1.20	3906	40.63

Fig. 10

Polyglycolic acid

Supply speed: 0.5 m/min

Filament	Wind-up speed m/min	Filament diameter μ m	Draw ratio	Birefringence x10 ⁻³
Drawn filament	100	9.4	77	6.4
	300	5.7	208	7.0
	500	3.9	445	8.0
	700	3.3	427	11.3
	900	3.1	621	15.8
	1100	2.6	1025	17.5
	1300	2.3	1280	22.1
	1500	2.3	1280	27.0
	1700	2.2	1350	27.9

Fig. 11

Polyglycolic acid

Supply speed: 0.5 m/min

Filament	Wind-up speed m/min	Filament diameter μ m	Draw ratio	Birefringence $\times 10^{-3}$
Drawn filament	100	16.0	167	5.3
	300	8.6	580	16.9
	500	5.1	1647	26.1